

AD-A154 527 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WINDSOR LAKE DAM MA 0. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JUL 78

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MA NEW ENGLAND DIV JUL 78

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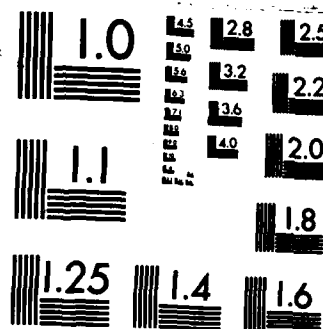
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) -Windsor Lake Dam is an earth embankment about 375 ft. long with a maximum height of about 20 ft. The project is considered to be in good condition. The dam is classified as small in size with a high hazard potential. In addition there are a few remedial measures that are recommended for implementation by the owner.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

MAY 23 1979

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

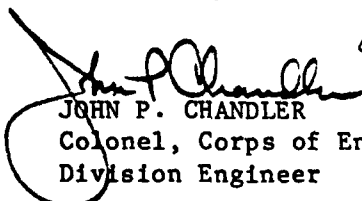
I am forwarding to you a copy of the Windsor Lake Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the City of North Adams, Public Works Department, 253 Kemp Avenue, North Adams, Massachusetts 01247, ATTN: Office of the Commissioner.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

This document has been approved
for public release and sale; its
distribution is unlimited.

**WINDSOR LAKE DAM
MA 00281**

**HUDSON RIVER BASIN
NORTH ADAMS, MASSACHUSETTS**

**PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

Inventory No.:	MA 00281
Name of Dam:	WINDSOR LAKE DAM
Town Located:	NORTH ADAMS
County Located:	BERKSHIRE
State Located:	COMMONWEALTH OF MASSACHUSETTS
Date of Inspection	21 JUNE 1978

BRIEF ASSESSMENT

Windsor Lake Dam is an earth embankment about 375 feet long with a maximum height of about 20 feet. On the west abutment of the dam there is a 12.5 foot long stone masonry and concrete spillway. The spillway sill has been narrowed to 6 feet by the construction of two concrete headwalls. A dike, about 325 feet long and 10 feet high, is located at the north end of the lake. The intake for a 12-inch diameter low level outlet pipe is located near the north end of the lake. The length of the pipe is about 5000 feet. Water is discharged into the North Branch of the Hoosic River.

Phase I inspection and evaluation of Windsor Lake Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgement and the performance of the earth embankment, dike and outlet works, the project is considered to be in good condition. The project, however, does have a number of deficiencies which, if not remedied, have the potential for developing into hazardous conditions.

Because there are no data on Probable Maximum Floods for a drainage area of 0.34 square miles, it was necessary to synthesize a test flood hydrograph for the contributing area. Because the dam is classified as small in size, with a high hazard potential, the test flood, in accordance with Corps of Engineers guidelines, falls between one half the Probable Maximum Flood and the Probable Maximum Flood (PMF). Selection of 1/2 PMF as the test flood, yields an outflow of 200 cfs which is greater than the maximum spillway discharge capacity of 110 cfs and would result in an overtopping of the dam by about one foot. Since the dam will be overtopped by the test flood, it is considered that the spillway is inadequate from a hydraulic and

hydrologic viewpoint. However, overtopping of the dam with a short duration, small head, would probably not breach the heavily vegetated slope of the dam. Nevertheless, a number of alternatives are recommended for implementation by the owner within 12 months of receipt of this Phase I Inspection Report for providing adequate spillway capacity.

In addition, remedial measures are recommended for implementation by the owner within 24 months of receipt of this Phase I Inspection Report to improve overall conditions. These measures, in general, are as follows:

- Programs for observing and monitoring seepage
- Repairs to embankments and appurtenant structures
- Programs for operation, maintenance and inspection



Eugene O'Brien P.E.
New York No. 29823

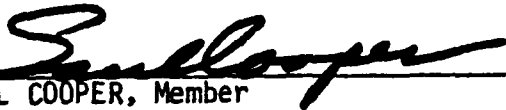
This Phase I Inspection Report on Windsor Lake Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.



CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

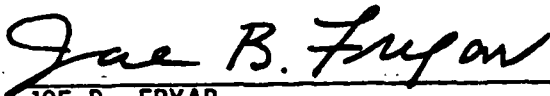


FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division



SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:



JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

HUDSON RIVER BASIN
WINDSOR LAKE DAM
INVENTORY NO. MA 00281
PHASE I INSPECTION REPORT

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SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

Operational procedures for the project are not formally established but are based on the experience of the operating personnel.

4.2 MAINTENANCE OF DAM

There is no formal maintenance manual for the project. Maintenance of the embankment is minimal. There is no scheduled program of inspection by the City's personnel, however, there is a statewide program of inspection established several years ago by the Department of Environmental Quality Engineering, Division of Waterways. Prior to these inspections, the County of Berkshire conducted inspections; a copy of their last report dated 9 October 1967 is given in the Appendix. Also included, for historical purposes, is a letter inspection report of 5 August 1907 submitted by the Division Engineer, Massachusetts Highway Commission.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is no established maintenance program for the operating facilities. Maintenance is carried out as needed.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect or one planned.

4.5 EVALUATION

The maintenance and operating procedures for the dam and appurtenant structures are considered inadequate. Measures to improve these deficiencies are given in Section 7.

EVALUATION OF OBSERVATIONS

Visual inspections made during the course of the inspection revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, these deficiencies do require attention and should be corrected before further deterioration leads to a hazardous condition. Recommended measures to improve these conditions are given in Section 7.

The vertical and horizontal alignment of the crest is good with only slight erosion caused by trespassing.

The downstream slope, portions of which were rebuilt last year, is in good condition with new grass growing. It was reported that the portion of the dike with the flatter slope was placed last year using fill from street repairs. It is expected that the remaining steeper slope will be flattened in the near future. (See Photograph No. 15).

d. Appurtenant Structures

The stone masonry and concrete spillway is in fair condition with loose and missing mortar in the joints and displacement of some of the masonry on the weir. The stone floor of the structure is covered with silt and vegetation. Several of the stones have been displaced especially in the area around the edge and front of the sill. (See Photograph Nos. 5 & 6)

The 12-inch intake structure was not visible since it was submerged. The manhole which contains the 12-inch gate valve appears in good condition and the valve is operable. The top of the valve stem protrudes above the manhole cover and is bent. The outlet from the pipe, on the wall of the concrete channel lining, is in good condition, however, the 10-inch bleeder valve is reported difficult to operate. There are plans to replace the valve.

e. Abutments

There were no signs of seepage or other unusual conditions at the abutments.

f. Downstream Channel

It appears that the berm, which probably was placed subsequent to the construction of the dam, blocks the original downstream spillway channel. To prevent flows over the top of the berm, the channel has been blocked by the placement of large boulders. This blockage has caused a new channel to form along the contact between the toe of the embankment and the top of the berm. (See Photograph Nos. 7-9). The channel, beyond the end of the berm, follows the contact between the toe of the embankment and natural ground, ending in the swampy area located in the vicinity of the maximum dam section. The discharges from the swamp are through twin barrelled 30-inch diameter concrete conduits, located about 110 feet downstream from the embankment toe, under a roadway and then into an unobstructed channel in a forested area (Bennett Brook). (See Photograph Nos. 10 & 14).

g. Reservoir Area

In the vicinity of the dam there is no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of Windsor Lake Dam was made on 21 June 1978. The weather was sunny, temperature between 75° and 80°F. Rain-fall reportedly occurred two days before with a 1.3 inch intensity. At the time of the inspection the lake level was about 6 inches below spillway crest.

b. Main Embankment

The earth embankment appears to be in generally good condition. The horizontal and vertical alignments of the crest are generally good except for some erosion resulting from pedestrian traffic. (See Photograph No.3).

The upstream slope does not show any sloughing or trespassing, but there is minor erosion, riprap displacement, many large trees and some vegetation. Evidence exists that several large trees have been cut down recently.

The downstream slope does not show any general erosion or sloughing. There are, however, several transverse pedestrian paths which have caused minor erosion. There is a heavy growth of vegetation, including large trees (See Photograph No. 4).

There are several seepage areas and general dampness on the slope starting about 240 feet east of the spillway structure and extending eastward for about 130 feet. The upper limit of the wet zone varies from 34 to 38 feet below the crest edge, measured along the slope. At the toe of the maximum dam section, extending downstream for a distance of about 110 feet, the entire area is swampy. (See Photograph Nos. 11-13).

A well maintained, grassed fill area is located downstream of the spillway structure. It is about 200 feet long, 30 feet wide, 6 to 10 feet high, and about 10 feet below the crest of the dam. It appears to act as a berm for the west side of the dam. (See Photograph No. 8).

c. Dike

A dike located at the north end of the lake appears generally in good condition with some repairs having been performed last year. The upstream slope has been riprapped with new stone, and several large trees have been cut down. However, there are still several trees remaining. (See Photograph Nos. 15 & 16).

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Design data, drawings or specific memoranda are not available for the original construction of the dam. There is a topographic sheet made from photogrammetric surveys of part of the dam and is included in the Appendix. Sketch of the dam, sections and plan, given in the Appendix were drawn from rough field measurements made at the time of the visual inspection.

There is little information on subsurface conditions. In August 1969, three borings were drilled by Taconic Soil Investigation Inc., New Lebanon, N.Y., for Robert B. DeLoye Inc., Architects-Engineers, Pittsfield, Mass. A spokesman for DeLoye Inc. reported that to the best of their recollection the drilling was part of a study to evaluate the seepage which existed at the toe of the embankment. No record of their report is available. However, a copy of the boring logs and a rough sketch of the boring locations are given in the Appendix.

2.2 CONSTRUCTION RECORDS

There are no detailed construction records available.

2.3 OPERATING RECORDS

No operation records are available and there is no daily record of pool elevation and rainfall at the dam site.

2.4 EVALUATION OF DATA

a. Availability

Existing information was made available by Office of Engineering, City of North Adams and Robert B. DeLoye Architects-Engineers, Inc., Pittsfield, Mass.

b. Adequacy

The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgement.

c. Validity

In general, the information obtained from the above mentioned documents and personal interviews is consistent with observations made during the inspection and therefore considered reliable.

i. Spillway

Type

Broad crested-
Stone Masonry

Length of weir

6 feet

Crest elevation

966 \pm feet

Gates

None

Upstream channel

None

Downstream channel

See Description
in Section 1.2
and Section 3.1f.

General

None

j. Regulating Outlets

The regulating outlets consist of an uncontrolled stone masonry spillway and a 12-inch diameter cast iron low level outlet.

The spillway is 6 feet long, with a 3 feet crest width at El 966 \pm .

The low level outlet is a 5000 \pm feet long cast iron pipe located near the north end of the lake and outfalls into the North Branch of the Hoosic River. The discharges are controlled by means of an operating 12-inch gate valve located in a manhole at the north end of the lake. The invert elevation of the outlet is unknown.

- d. Reservoir
Length of maximum pool 1650± feet
Length of recreation pool 1225± feet
Length of flood control pool Not Applicable
- e. Storage (acre-feet)
Recreation pool 105±
Flood control pool Not Applicable
Design surcharge Unknown
Test flood surcharge 109.7
Top of dam 80
- f. Reservoir Surface (acres)
Top of dam 28.6±
Test flood pool 29.7
Flood-control pool Not Applicable
Recreation pool 25±
Spillway crest 25±
- g. Dam
Type Earth
Length 375± feet
Height 20± feet
Top width 12± feet
Side Slopes-Upstream 1 (V): 2 (H)
-Downstream 1 (V): 1.6 (H) to 1 (V): 2 (H)
Zoning Unknown
Impervious core Unknown
Cutoff Unknown
Grout curtain Unknown
Other None
- h. Diversion and Regulating Tunnel
Type Not Applicable
Length Not Applicable
Closure Not Applicable
Access Not Applicable
Regulating facilities Not Applicable

i. Operator
The person responsible for the day-to-day operation of the dam is:

Mr. Robert E. Galipean, Foreman
Public Works Department
Water Department
253 Kemp Avenue
North Adams, Mass. 01247
Tel. No.: (Home) 413-663-8757
(Office) 413-633-5510

1.3 PERTINENT DATA

a. Drainage Area

The total drainage area contributing to Windsor Lake is 0.34 square miles (219 acres), with no defined drainage channels. The basin is mainly undeveloped park with some forest and very little urban development. The surface area of the lake, at spillway crest (25 acres), is about 11% of the total drainage area.

b. Discharge at Damsite

The stone masonry spillway on Windsor Lake Dam is 6 feet at the base with a flat crest 3 feet wide at El 966 \pm . The computed maximum discharge at a maximum head of 3 feet, corresponding to the top of the dam (El 969), is 110 cfs.

There is no record of the maximum flood at the damsite but reportedly, the dam has never been overtopped during a major flood.

c. Elevation (ft. above MSL)

Top of dam	969 \pm
Maximum pool-design surcharge	Unknown
Maximum pool-test flood surcharge	970
Full flood control pool	Not Applicable
Recreation pool	966 \pm
Spillway crest (gated)	Not Applicable
Upstream portal invert diversion tunnel	Not Applicable
Downstream portal invert diversion tunnel	Not Applicable
Streambed at centerline of dam	949 \pm
Maximum tailwater	Unknown

beach and campground. The east side is private property. There are no streams of any significant size supplying water to the lake.

c. Ownership

Windsor Lake Dam is owned by the City of North Adams. The day-to-day operation and maintenance is managed by the Water Department of the Public Works Department and the Parks and Recreation Department, respectively.

d. Purpose of Dam

The impoundment provided by the dam is for recreational purposes.

e. Design and Construction History

Original design and construction records are not available. It is reported the dam was built about 1883 for the Windsor Print Company, North Adams.

f. Normal Operating Procedures

There are no normal operating procedures. The operating foreman, based upon his experience, controls discharges from the low level outlet in order to maintain the lake level. It is reported, that the lake level is maintained slightly below the spillway crest in summer and is drawn down in the winter.

g. Size Classification

The dam is less than 40 feet high and has a storage capacity of less than 1000 acre-feet, therefore it is classified as a "small" dam.

h. Hazard Classification

Windsor Lake Dam has a two fold hazard potential, the area downstream of the main embankment and downstream of the dike. In the vicinity of the main embankment toe there is an overnight camping facility which could accomodate 50 or more people. About 0.5 miles downstream in the vicinity of Mass. Route 8A there are 5 to 10 buildings. Should the main embankment fail, there would be substantial damage in the campgrounds with possible loss of life, and some damage occurring further downstream.

In the immediate downstream vicinity of the dike there are 10 to 15 one-and two-family houses. Further downstream (0.2+ mile) the area is completely built up with many single and multiple family dwellings. Should the dike fail, substantial damage would occur with possible loss of life. For these reasons the dam is in a "high" hazard potential category.

For details on the selection of the hazard potential category see Section 5.6.

approximately 1 (V): 2 (H) and 1 (V): 1.6(H) to 1 (V): 2 (H) respectively. The lower 12 feet of the downstream slope, at the maximum section, is about 1 (V): 3 (H). The upstream slope is protected with riprap to within 5 feet of the crest. Both slopes are covered with a heavy growth of trees, bushes, shrubs and ground cover. A fill area, about 200 feet long, 30 feet wide and 6 to 10 feet high, which effectively acts as a berm is located near the west abutment, on the downstream slope.

A stone masonry and concrete spillway structure is located at the west abutment. The spillway sill is about 3 feet wide, 12-1/2 feet long, and about 3 feet high. Capping the sill is a rectangular notched concrete headwall with an opening 6 feet wide by 1.9 feet high. The stone masonry training walls are approximately 25 feet long with a maximum height of 5 feet above the spillway channel. The spillway sill is located about one foot from the upstream end of the walls. The training wall is 1 foot above the spillway crest where it joins the crest. The downstream spillway channel floor, is protected with riprap within the limits of the training walls.

A 325± feet long dike having a maximum height and crest width of about 10 feet is located at the north end of the lake. The upstream slope is 1 (V): 2 (H), and is protected by 18-inch riprap. Several very large trees are growing on the slope. The downstream slope varies from 1 (V): 3 (H) on the west end and 1 (V): 7 (H) on the east end. The flatter slope was placed last year and there are plans to flatten the remaining slope. The entire slope has been seeded recently.

A low level outlet is located near the north end of the lake. Discharges are through a 12-inch diameter cast iron pipe, controlled by a manually operated gate valve located in a manhole about 20 feet from the crest, on the downstream slope of the dike. The pipe carries water a distance of about 5000 feet, to an old mill (no longer in operation) located on Union Street. Discharges from the mill, outfall into a concrete lined channel of North Branch, a tributary of the Hoosic River. To prevent water from freezing in the pipe, a 10-inch diameter pipe and bleeder valve are connected near the end of the 12 inch pipe, and a steady low flow is maintained almost all the time. This bleeder discharge also outfalls into the North Branch channel.

b. Location

The dam is located southeast of the intersection of Bradley and Kemp Streets, North Adams, approximately 1/2 mile east of the Hoosic River. The area around the lake except for the east side is a City park,

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
HUDSON RIVER BASIN
INVENTORY NO. MA 00281
WINDSOR LAKE DAM
CITY OF NORTH ADAMS
BERKSHIRE COUNTY, COMMONWEALTH OF MASSACHUSETTS

SECTION I-PROJECT INFORMATION

1.1 GENERAL

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Tippetts-Abbott-McCarthy-Stratton has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Tippetts-Abbott-McCarthy-Stratton under a letter of May 3, 1978, from Mr. Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0298 has been assigned by the Corps of Engineers for this work.

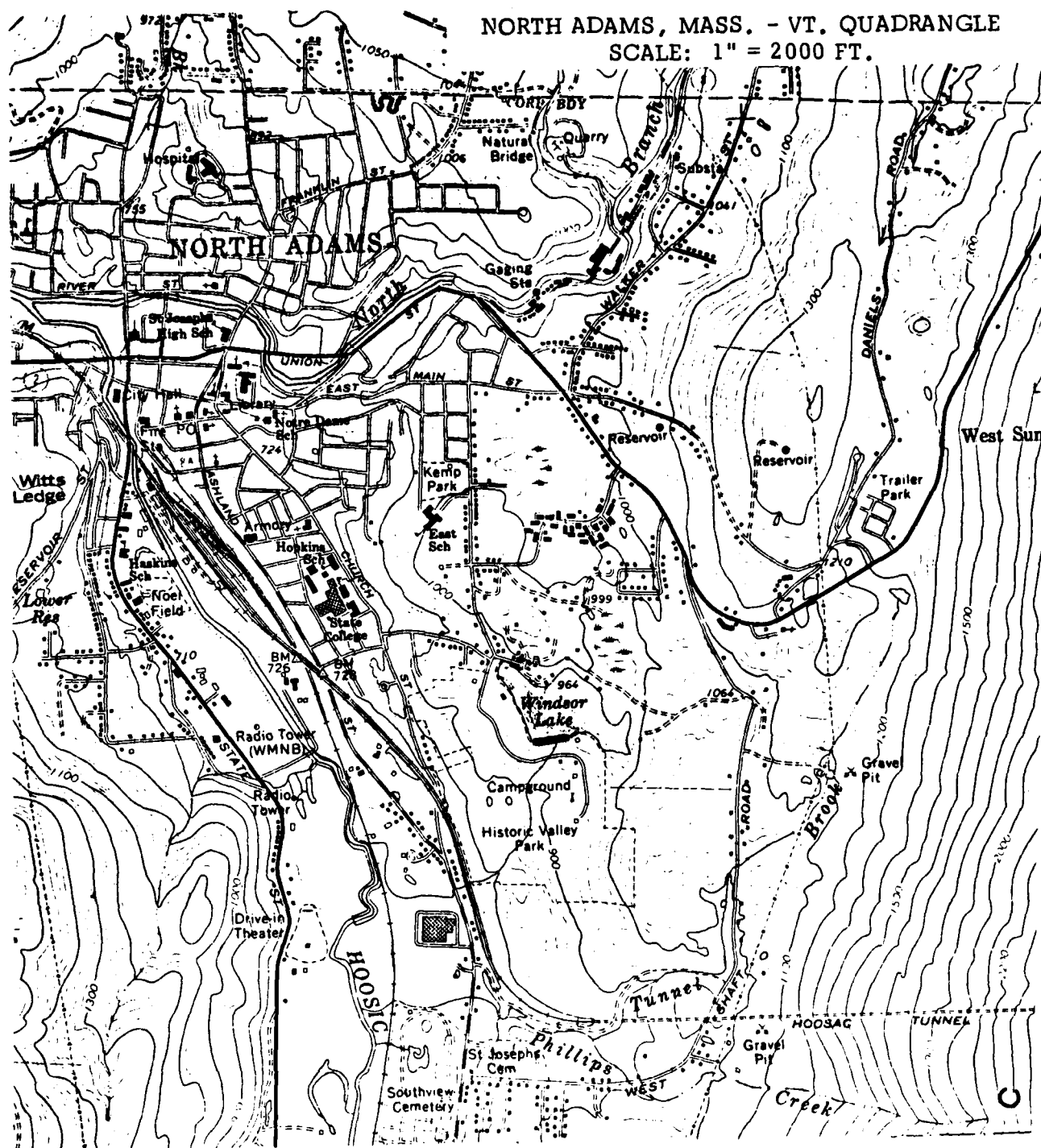
b. Purpose

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF THE PROJECT

a. Description of Dam and Appurtenances

Windsor Lake Dam is an earth dam approximately 375 feet long with a maximum height of about 20 feet and crest width of about 12 feet. The horizontal alignment of the crest has a slight reverse "S" shape. The upstream and downstream slopes of the embankment, as observed, are



TOPOGRAPHIC MAP
WINDSOR LAKE DAM AND RESERVOIR



VICINITY MAP
WINDSOR LAKE



① GENERAL OVERVIEW OF DAM

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

The total drainage area contributing to the Windsor Lake is 0.34 sq. mile (219 acres), with no defined drainage channels. The basin is mainly undeveloped park with some forest and very little urban development.

5.2 SPILLWAY CAPACITY

The stone masonry spillway on Windsor Lake Dam is 6 feet at the base with a flat crest 3 feet wide. A sketch of the spillway is shown in the Appendix. The computed maximum discharge at a maximum head of 3 feet (El 969), corresponding to the top of the dam, is 110 cfs. It was assumed that the spillway acted as a broad-crested weir and that the weir coefficient varied from 2.44 at 0.2-foot head, to 2.92 at 3.0-foot head.

5.3 RESERVOIR CAPACITY

The maximum capacity of Windsor Lake is given as 185 acre-feet^{1/}. It is estimated that the surcharge storage available is about 80.3 acre-feet, which is equivalent to 4.4 inches of runoff over the entire basin.

5.4 FLOODS OF RECORD

There are no records of flow from this small drainage area, and no records of the maximum water elevation in the lake.

5.5 DESIGN FLOOD

Because there are no data on Probable Maximum Floods for an area of 0.34 square miles, it was necessary to synthesize a test flood hydrograph for the contributing area. Initially, a depth-duration relation for maximum probable point rainfall (10 square miles area), for duration of 6 hours to 24 hours, was taken from Weather Bureau Sources.^{2/} The distribution of the rainfall was based on data in a publication of the World Meteorological Organization.^{3/} Increments of depth from the depth-duration relation, at one hour intervals, were arranged in the probable storm sequence given below:

1/ National Program of Inspection of Dams, U.S. Corps of Engineers, Vol. III, May 1975.

2/ Seasonal Variation of the Probable Maximum Precipitation East of the 105 Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours, Hydro-meteorological Report No. 33, 1956.

3/ Manual for Estimation of Probable Maximum Precipitation, World Meteorological Organization, Operational Hydrology Report No. 1973.

Time (hours)	Precipitation (inches)
1.0	1.5
2.0	1.8
3.0	3.4
4.0	7.0
5.0	2.7
6.0	1.3
7.0	0.8
8.0	0.5
9.0	0.5
10.0	0.35

Since runoff to the lake will be overland flow from a strip of land about 4200 feet in length, it was estimated that there would be a lag time of one hour. No losses were deducted from rainfall on the lake while an infiltration loss of 0.2 inches per hour was deducted from the rainfall.

The resulting Probable Maximum Flood inflow peak was 1387 cfs with a runoff volume equivalent to 19.85 inches in 10 hours; 89 percent of the precipitation occurs in the first 6 hours. From this discharge, the peak taken equivalent to one half the Probable Maximum Flood is estimated to be approximately 694 cfs. The hydrograph assumptions are conservative but believed to be necessary in the evaluation of the adequacy of the spillway.

5.6 OVERTOPPING POTENTIAL

The adequacy of the spillway has been tested by routing the synthesized Flood through the reservoir using a computerized routing technique. The water surface was assumed to be at the spillway crest at the beginning of the inflow. The routed flood overtopped the dam by 1 foot with a peak outflow discharge of 200 cfs.

In order to estimate the downstream dam failure hydrograph, the U.S. Corps of Engineers "Rule of Thumb" guidance was used. The estimate assumes: (a) the reservoir surface is at the top of the dam at the time of the breach, (b) a breach of 40% of the dam length occurs (130 feet) and (c) the channel has an average roughness coefficient (n) of 0.07. It is estimated that at a selected section, 500 feet downstream of the dike, the peak flood wave discharge is 6750 cfs with a wave height of about 12 feet. The visual inspection corroborates the information shown on the USGS Quadrangle sheet for North Adams, Mass., which indicates, at this section, 10 to 15 houses at or about El 910. These houses would probably be destroyed or damaged by the estimated flood wave.

5.7 EVALUATION

Since the dam will be overtopped by 1 foot under one half the computed Probable Maximum Flood the spillway is considered to be inadequate from a hydraulic and hydrologic viewpoint.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did not indicate any serious structural problems with the embankment, spillway chute or 12-inch diameter outlet pipe system. The deficiencies, which are described in Section 3 require attention; recommended remedial measures to improve the deficient conditions are given in Section 7.

b. Design and Construction Data

No design computations or other data regarding the structural stability of the dam have been located.

On the basis of the performance experience, the visual inspection, as well as engineering judgment, the dam appears to be structurally adequate.

c. Operating Records

There are no operating records kept or available. There are no records or reports of any operational problems which would affect the stability of the dam. There is one item, the difficulty in operating the 10-inch bleeder valve on the outlet pipe, which could lead to problems. However, it is reported that funds have already been allocated for replacement of this valve.

d. Post-Construction Changes

It is reported the dam was built sometime around 1883. There are no records of any construction changes which have taken place since that time. It is reported, however, the 12-inch diameter pipe and gate valve were replaced in 1969 and repairs to the dike were carried out in 1977. Details of the construction are not available.

e. Seismic Stability

The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition

Phase I investigation of Windsor Lake Dam does not indicate conditions which would constitute an immediate hazard to human life or property. Based on engineering judgment and the performance of the earth embankment, the dike and the outlet works, the project is considered to be in good condition. The project, however, does have a number of deficiencies which, if not remedied, have the potential for developing into hazardous conditions.

Because there are no data on Probable Maximum Floods for a drainage area of this size and condition, it was necessary to synthesize a test flood hydrograph for the contributing area. The resulting Probable Maximum Flood inflow peak; was 1387 cfs, with a runoff volume equivalent to 19.85 inches in 10 hours; 89 percent of the precipitation occurs in the first 6 hours. The peak discharge, taken equivalent to one half the Probable Maximum Flood, is estimated to be approximately 694 cfs.

The adequacy of the spillway was tested by routing the synthesized flood through the reservoir using a computerized routing technique. The routing results in an overtopping of the dam by 1 foot with a peak outflow discharge of about 200 cfs. Since the dam will be overtopped under one half the computed Probable Maximum Flood, the spillway is considered to be inadequate from a hydraulic and hydrologic viewpoint.

b. Adequacy of Information

The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and sound engineering judgment.

c. Urgency

Several recommendations and remedial measures described in subsequent paragraphs should be implemented by the owner within 12 months after receipt of this Phase I Inspection Report; others should be implemented within 24 months.

d. Necessity for Additional Investigations

Additional investigations to assess the adequacy of the dam and appurtenant structures do not appear necessary.

7.2 RECOMMENDATIONS

It is recommended that, within 12 months of receipt of this report, the owner remove the two concrete headwalls which reduce the original width of the spillway. In addition consideration should be given to either widening the existing spillway or constructing an adequate spillway at a different location.

7.3 REMEDIAL MEASURES

a. Alternatives

The inadequacy of the spillway described in Section 5.6 and 5.7 should be corrected by the owner by removing the two concrete headwalls which reduce the original width of the spillway. This would more than double the width of the spillway (from 6 to 12.5 feet). The total spillway capacity would then be 190 cfs and would result in a computed overtopping of the dam by about 0.2 foot. This is not considered critical, since the assumptions used in calculating the test flood and the flow coefficient used for the weir are conservative. In addition, overtopping of the dam with a short duration, small head, would probably not breach the heavily vegetated slope of the dam. Nevertheless, to prevent possible overtopping, consideration should be given to further widening of the existing spillway or constructing an adequate spillway at a different location.

b. Operation & Maintenance Procedures

The owner should undertake the following measures within 24 months after receipt of this Phase I Inspection Report.

1. A systematic program of observations and monitoring of changes in the pattern and quantity of seepage should be established. Observations can be accomplished by the installation of piezometers, weirs or flow meters.
2. A formal schedule of operations, maintenance and biannual inspections be initiated.
3. Round the clock surveillance should be provided by the owner during periods of unusually heavy precipitation.
4. The owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.
5. The downstream channel of the spillway should be relocated away from the toe of the embankment.

6. Riprap protection below the spillway crest should be cleared, rebuilt and inspected regularly, especially following heavy storms.

7. Masonry training walls of the spillway should be repaired.

8. Pathways formed on the crest and downstream slope of the dam and dike should be filled with suitable compacted embankment material and restored to grade. Measures should be taken to prevent their reoccurrence.

9. The top of the 12-inch valve stem in the manhole should be straightened. Measures should be taken to lower the stem below the cover.

10. The 10-inch bleeder valve should be replaced or repaired so that it operates easily.

11. All brush, shrubs, and young saplings should be removed from all locations on the embankments and spillway channel. Large conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be closely monitored for seepage.

VISUAL INSPECTION CHECK LIST

APPENDIX A

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT WINDSOR LAKE DAM

DATE 6-21-78

TIME 11:00 AM

WEATHER Sunny

W.S. ELEV. 955.6⁺ U.S.

PARTY:

- | | |
|------------------------------|-----------|
| 1. <u>HARVEY S. FELDMAN</u> | 6. _____ |
| 2. <u>JYOTINDRA H. PATEL</u> | 7. _____ |
| 3. _____ | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>All project features inspected by the party members.</u>		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

PROJECT WINDSOR LAKE DAM DATE 6-21-78
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

DAM
~~DAKE~~ EMBANKMENT

Crest Elevation 958.0⁺

Current Pool Elevation 955.6⁺

Maximum Impoundment to Date _____

Surface Cracks None Visible

Pavement Condition —

Movement or Settlement of Crest None observed

Lateral Movement None

Vertical Alignment Generally Good

Horizontal Alignment Generally Good

Condition at Abutment and at ^{Masonry}~~Concrete~~ Structures Generally Good

Indications of Movement of Structural Items on Slopes _____

Trespassing on Slopes Pathways on crest and several on Downstream slope

Sloughing or Erosion of Slopes or Abutments Minor erosion on Upstream slope; Sloughing on Downstream where slope is steeper than average.

Rock Slope Protection - Riprap Failures Riprap submerged at upstream slope; and appears in generally good condition except in few locations where it is disturbed.

Unusual Movement or Cracking at or near Toes None observed because of thick vegetation and wetness.

Unusual Embankment or Downstream Almost entire downstream toe area wet and soggy [Swamp condition]. Heavy vegetation including large diameter trees At upstream slope some trees at crest.

Piping or Bolls None observed

Foundation Drainage Features None

Toe Drains None

Instrumentation System None

Miscellaneous on west end of embankment on downstream slope
a $200 \pm$ ft long by $30 \text{ ft} \pm$ (Min) width berm
has been placed. Top of berm is about same elevation
as the spillway discharge channel.
Few trees at crest have been cut previously.

PERIODIC INSPECTION CHECK LIST

PROJECT WINDSOR LAKE DAM DATE 6-21-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

~~DIKE~~ EMBANKMENT North West end of the Windsor Lake.

Crest Elevation _____

Current Pool Elevation _____

Maximum Impoundment to Date _____

Surface Cracks None

Pavement Condition _____

Movement or Settlement of Crest None observed

Lateral Movement None observed

Vertical Alignment Generally Good

Horizontal Alignment Generally Good

Condition at Abutment and at Concrete Structures Abutment condition

generally good

Indications of Movement of Structural Items on Slopes None observed

Trespassing on Slopes Pathway on crest

Sloughing or Erosion of Slopes or Abutments None observed

Rock Slope Protection - Riprap Failures Upstream Riprap repaired placed last year; submerged; and in good condition.

Unusual Movement or Cracking at or near Toes None observed

Unusual Embankment or Downstream Seepage Large diameter trees on upstream slope; some cut; some shrubs and sections of downstream slope recently filled and seeded.

ping or Boils None

oundation Drainage Features None

ie Drains None

strumentation System None

PERIODIC INSPECTION CHECK LIST

PROJECT WINDSOR LAKE DAM DATE 6-21-78
PROJECT FEATURE _____ NAME _____
DISCIPLINE _____ NAME _____

OUTLET WORKS - INTAKE CHANNEL AND
INTAKE STRUCTURE

- a. Approach Channel None
Slope Conditions _____
Bottom Conditions _____
Rock Slides or Falls _____
Log Boom _____
Debris _____
Condition of Concrete Lining _____
Drains or Weep Holes _____
- b. Intake Structure Submerged in lake at No. 11 S. 1
Condition of Concrete N/A
Stop Logs and Slots N/A

[illegible]

NOTATION: N = No. blows to drive 2" spoon 6" with 140 lb. pin wt. falling 30" per blow.
C = No. blows to drive 2½" casing 12" with 300 lb. weight falling 24" per blow.

E RT SH ET	8/30/69	TACONIC SOIL INVESTIGATIONS, INC. OF NEW LEBANON, N. Y. 12125 BORING LOG	HOLE NO. 1
	8/30/69		GRD. ELEV.
	OF		G. W. ELEV.
			G. W. DEPTH 11' 11"

JECT Dam Site LOCATION North Adams, Mass.

SAMPLE NO	BLOWS ON SAMPLER					BLOWS ON CASING C	SOIL CLASSIFICATION
	0-6	6-12	12-18	18-24	24-30		
1	3	3	4	3	5	5	Moist at 4' 6" Wet at 4' 10" Material was very soft. From 0' to 18' 9" medium to fine sand trace of gravel small - brown.
2	4	5	8	5	3	3	
3	4	3	1	1	4	4	
4	4	3	3	2	5	5	
						6	18' 9" to 20' blue silt, trace of clay. Bottom of hole 20'
						7	
						8	
						9	
5	1	10	11	9	10	10	
						11	
						12	
						13	
						14	
						15	
6	3	1	2	3	6	6	
						7	
						8	
						9	
						10	
						11	
						12	
						13	
						14	
						15	
7	1	1	1	1			

NOTATION: N = No. blows to drive 2" spoon 6" with 140lb. pin wt. falling 30" per blow.
C = No. blows to drive 2 1/2" using 12" with 300lb. weight falling 24" per blow.


ONIC SOIL INVESTIGATIONS, INC.
/ LEBANON, NEW YORK 12125

August 30, 1969

Robert De Loye, Architect
27 East Housatonic Street
Pittsfield, Mass.

Attention: Mr. Jim Beplat

Reference: Windsor Lake Dam Site

Samples were taken in conjunction with the standard penetration test in accordance with ASTM specification D 1586-64T.

Boring #1 was the only boring that blue silt with a trace of clay was encountered. The field penetration unconfined compressive strength test was 1.5 tons per square foot.

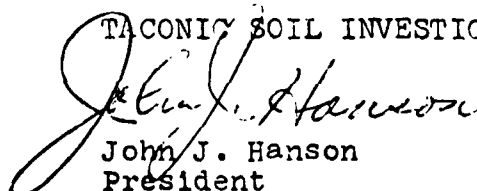
Boring #1 selected for water reading when finished had a hydrostatic ground water table at 4' 4" at end of boring. Five hours later it still was the same. Boring # 2 & 3 water reading was taken at end of boring.

Boring #1 had very soft material after 4' 10". Boring # 2 & 3 had a more dense material with the exception of boring # 3 from 13' 6" to 15' a soft spot was encountered.

If there are any further questions, please contact me.

Very truly yours,

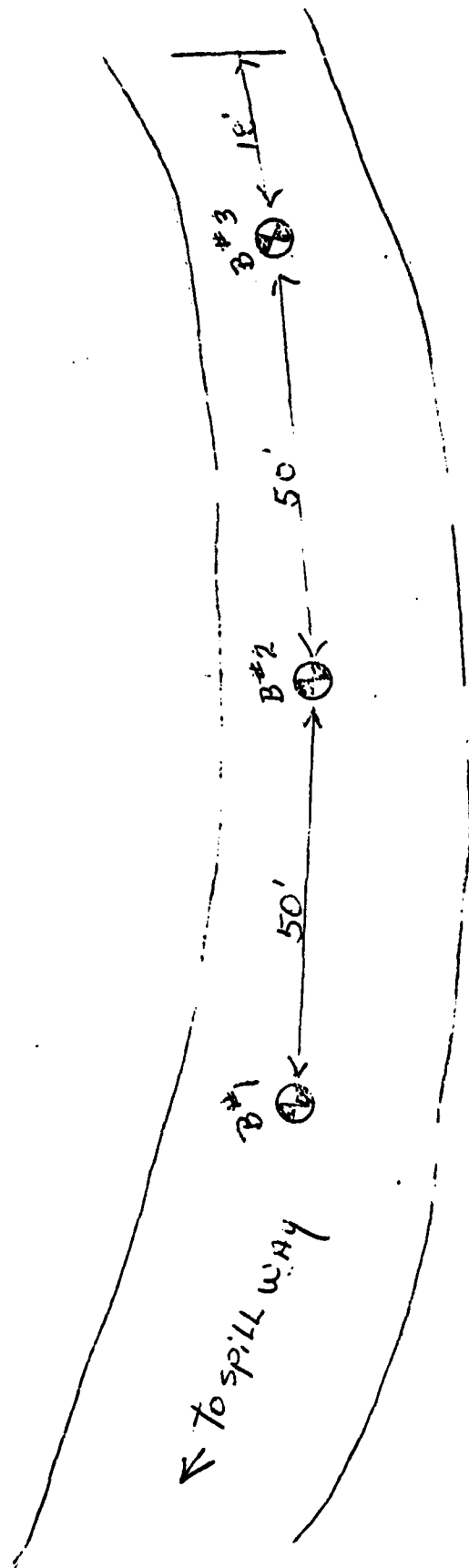
TACONIC SOIL INVESTIGATIONS, INC.


John J. Hanson
President

JJH:ah

Trail 748

WINDSOR LAKE



lim.

This is Not to scale but to let you know
How The Boring were put in

11

WINDSOR LAKE DAM.

ROBERT B. DELOYE, INC.

ARCHITECTS - ENGINEERS

27 EAST HOUSATONIC STREET • PITTSFIELD, MASSACHUSETTS 01201 • PHONE 448-8268

MESSAGE

REPLY

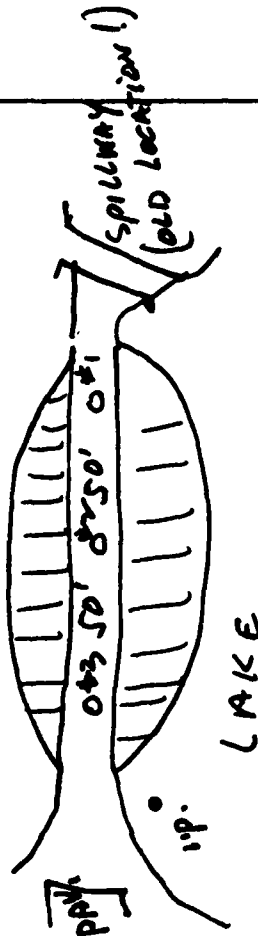
TO TAMS

DATE

ATTN. H. FEUDMAN

DATE 5/31/78

Encl. 1 tr. 8/30/69 & Soil logs 8/30/69
WINDSOR LAKE DAM, NORTH ADAMS, MASS.



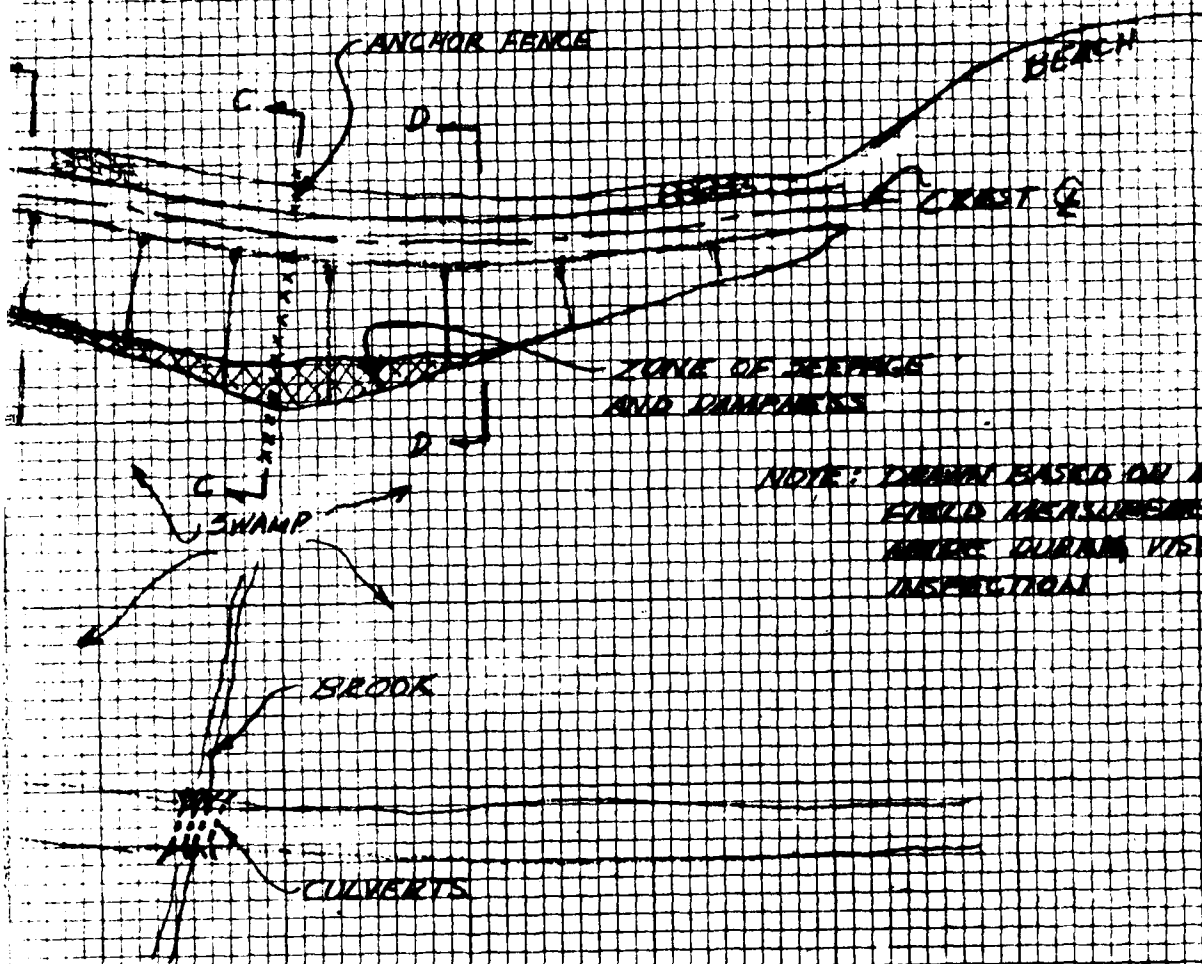
Rec'd
6/21/78

BY CFC. G. Breda - City Eng'r, N.A.

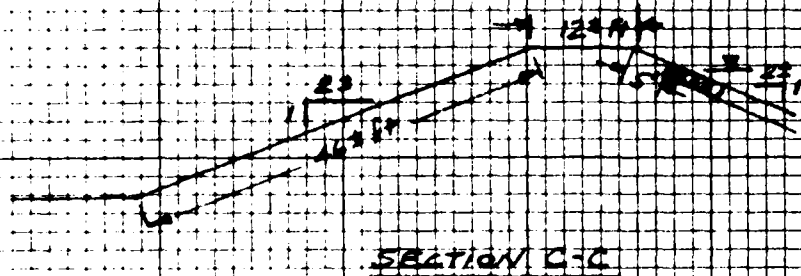
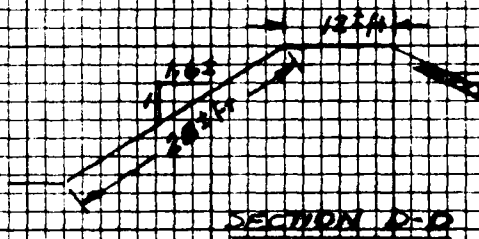
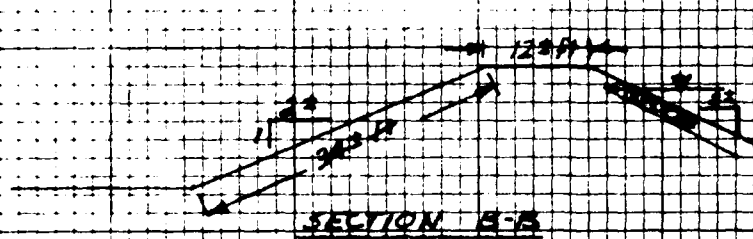
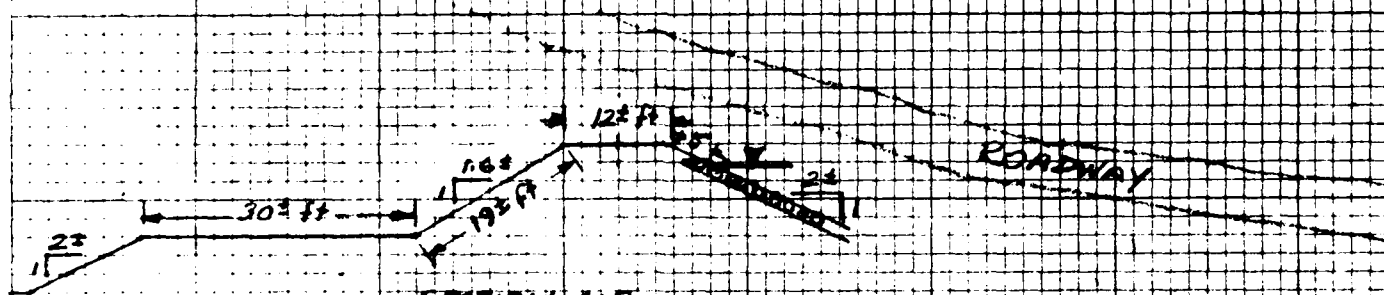
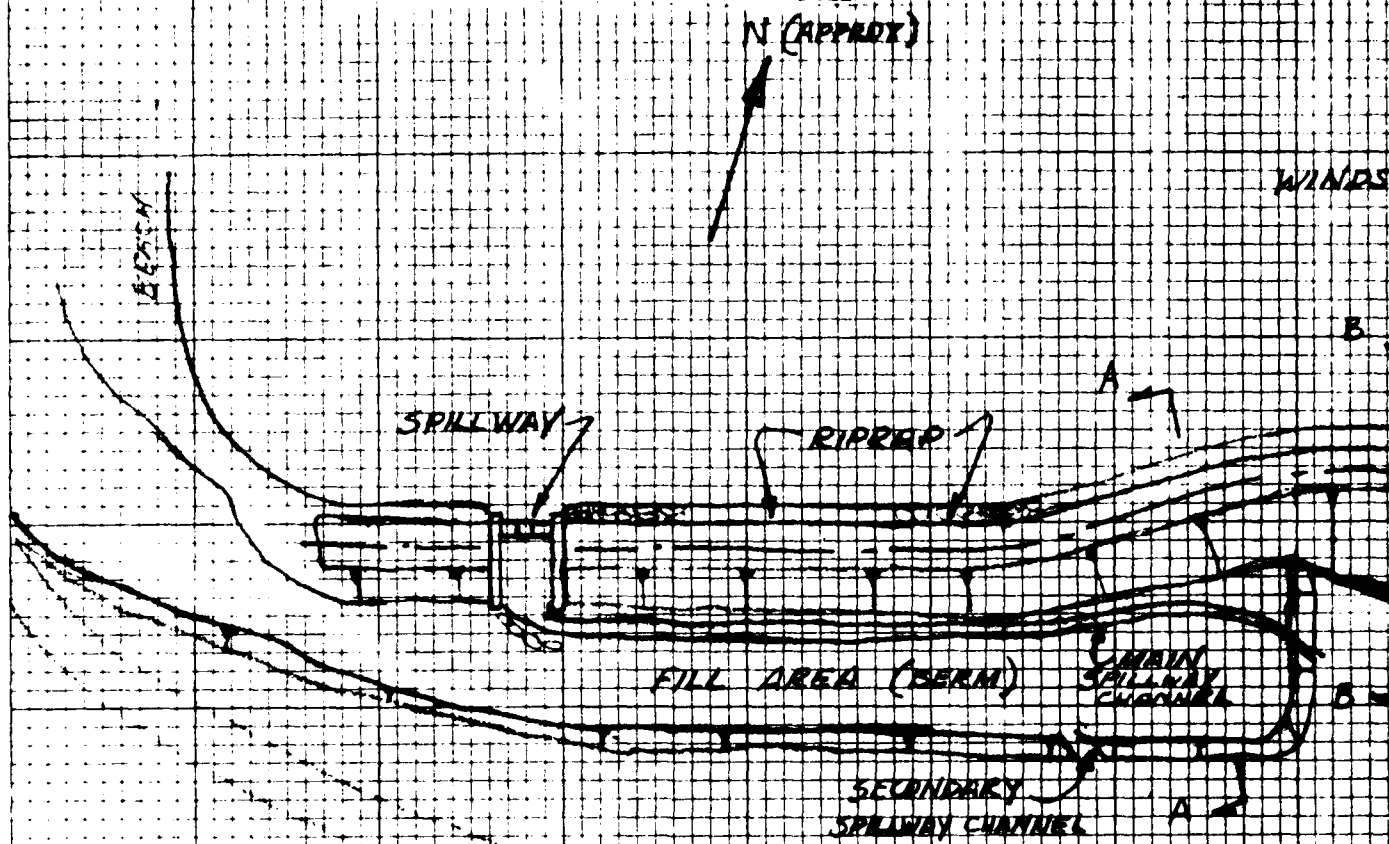
SIGNED R.A.J.

INSTRUCTIONS TO RECEIVER
1. WRITE REPLY 2. DETACH STUB. KEEP PINK COPY. RETURN WHITE COPY TO SENDER.

OR LAKE



TAMS	ARMY ENG. DIV. NEW ENGLAND
BRIDGELINE	COAST & GEOD. SURV. MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
WINDSOR LAKE DAM	
PLANS AND SECTIONS	
WINDSOR RIVER	MASS.
SCALE: N.P.E.	
DATE: 10/1/78	



200 Scale Topo Map Not Available
in this Drainage Area.

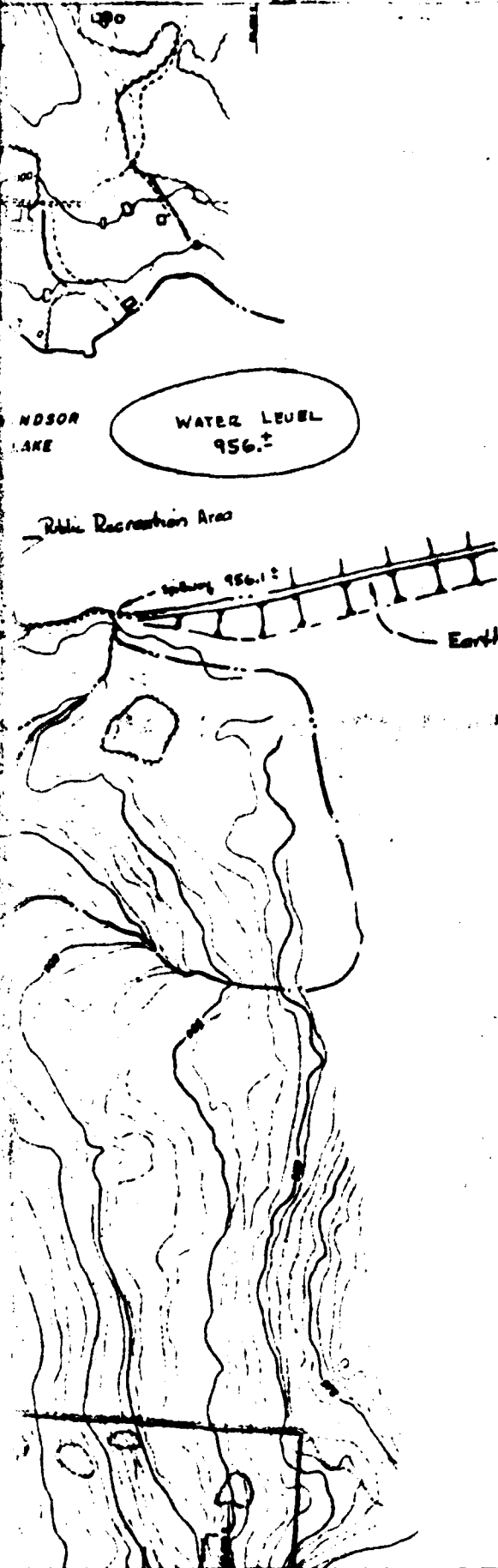
Dam to be inspected. ??

HORIZONTAL COORDINATE VALUES SHOWN
ARE BOTH STATE AND NORTH AMERICAN CITY
VERTICAL DATUM IS MEAN SEA LEVEL
ADD 10.51 feet To All Elevations
Convert To U.S.C. & S. System

SCALE 1"=200'
5' CONTOUR INTERVAL

SHEET NO. 10 OF 14 SHEETS

383



200 Scale Topo Map Not Available
in this Drainage Area.

Earth Dam to be Inspected. ??

NORTH ADAMS

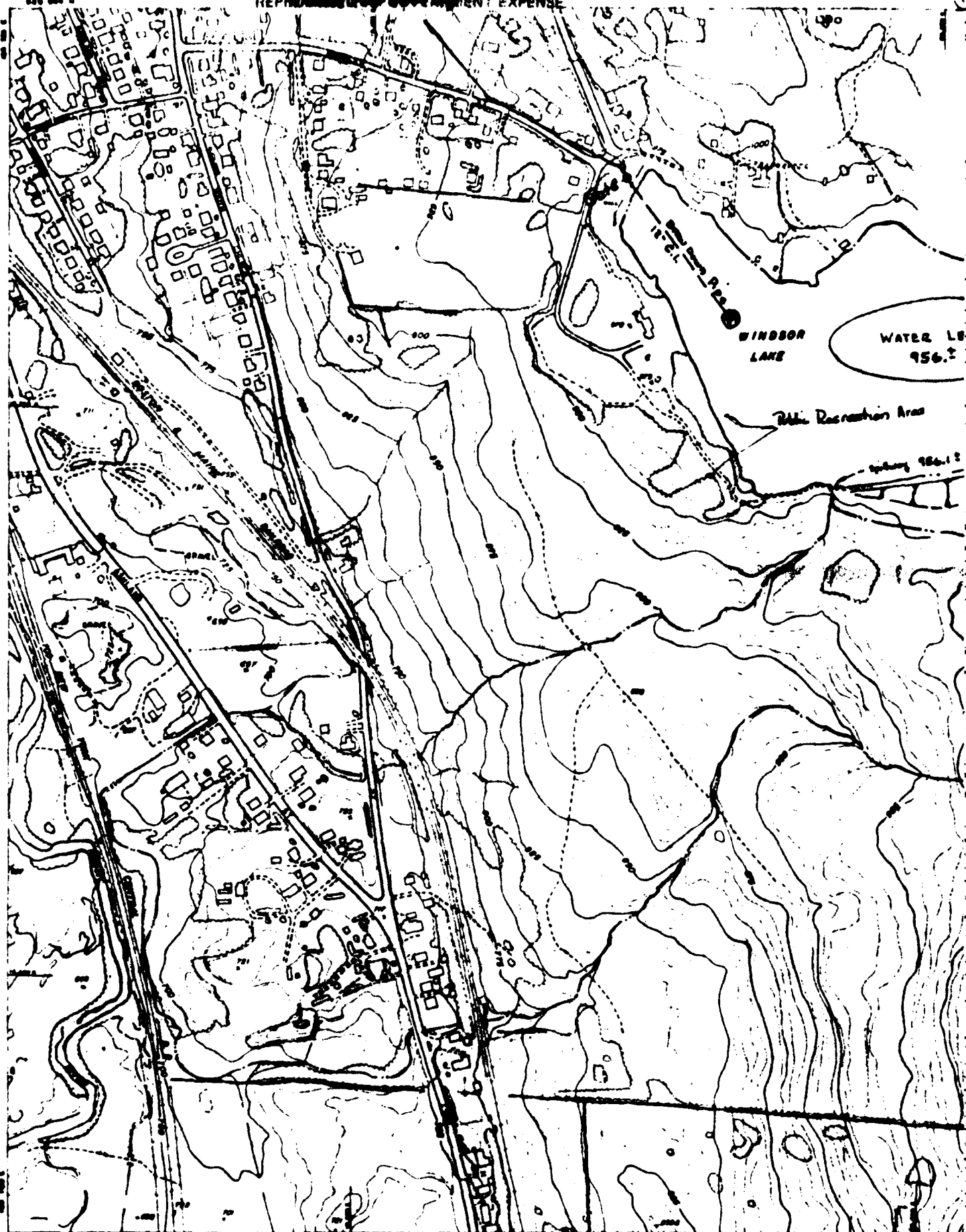
12

HORIZONTAL COORDINATE VALUES SHOWN
ARE BOTH STATE AND NORTH ADAMS CITY
VERTICAL DATUM IS NORTH ADAMS CITY
ADD 10.31 Feet To 88 Elevations
To Convert To U.S.C. & G. Elevation

SCALE 1" = 200'
5' CONTOUR INTERVAL

SHEET

2003



DRAWINGS AND INSPECTION REPORTS

APPENDIX B

Floor of Channel 25 ft from weir wall stoned floor & rest of
channel on natural bed. Stoned floor covered with soil and vegetation
except for center portion of channel. Natural bed loose gravel
~~and cobbles~~ and cobbles lying in channel.

Miscellaneous There is a secondary channel which
has developed apparently as result of overflow
from primary channel. This channel is located
downstream at the edge of berm

PERIODIC INSPECTION CHECK LIST

PROJECT WINDSOR LAKE DAM DATE 6-21-78
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

a. Approach Channel None

General Condition _____

Loose Rock Overhanging Channel _____

Trees Overhanging Channel _____

Floor of Approach Channel _____

b. Weir and Training Walls Masonry cemented Weir and Walls

General Condition of ~~Concrete~~ ^{Masonry} Generally good condition, however mortar is in poor condition.

Rust or Staining None observed

Spalling None observed

Any Visible Reinforcing None observed

Any Seepage or Efflorescence Slight dampness at the bottom of weir wall.

~~Miscellaneous~~ The sill of weir slopes towards lake

c. Discharge Channel

General Condition Very poor condition

Loose Rock Overhanging Channel large stones have been placed to divert the flow towards original stream.

Trees Overhanging Channel Many trees, shrubs, grass overhanging channel.

PERIODIC INSPECTION CHECK LIST

PROJECT _____ DATE 6-21-78

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

OUTLET WORKS - LOW LEVEL CONDUIT & INLET 12" Cast Iron Conduit and 10" Cast Iron Bleeder Pipe

General Condition ~~of Concrete~~ N/A

Rust or Staining of Concrete N/A

Spalling N/A

Erosion or Cavitation N/A

Cracking N/A

Alignment of Monoliths N/A

Alignment of Joints N/A

Numbering of Monoliths N/A

12" Cast Iron Conduit and inlet is submerged in lake. From lake conduit is partially above and under ground until it outfalls into North Branch of Hoosic River. [Concrete Lined Channel]. At outfall there is a 10" C I bleeder pipe with a Gate Valve.

At North West end of lake (Downstream slope of North West Dike) there is a 12" Gate Valve in a man hole. The stem of valve is protruding slightly above man hole cover.

PROJECT Dam Site LOCATION North Adams, Mass.

NOTATION: N = No. blows to drive 2" spoon 6" with 140 lb. pin wt. falling 30" per blow.
C = No. blows to drive 2½" casing 12" with 300 lb. weight falling 24" per blow.

BERKSHIRE COUNTY
MASSACHUSETTS

OFFICE OF THE
ENGINEERING DEPARTMENT
COURT HOUSE
PITTSFIELD, MASS. 01201



413-447-7156

WILLIAM A. HEAPHY,
COUNTY ENGINEER
ROBERT J. SAULNIER,
ASS'T. COUNTY ENGINEER

June 15, 1978

Tippetts-Abett-McCarthy-Stratton
Engineers and Architects
345 Park Avenue
New York, New York 10022

Att'n: H. S. Feldman

Dear Sir:

Enclosed herewith is a copy of the latest dam reports that I have pertaining to Pontoosuc Lake in Pittsfield, Ashmere Lake in Hinsdale and Windsor Lake in North Adams. As you probably know, the Commonwealth of Massachusetts took over inspection of dams from the county about eight years ago.

Also, I am enclosing a print of the Pontoosuc Dam that we had in our files. There is also a copy of a report of inspection of dams made in 1907 by one Mr. Joyner of the Massachusetts Highway Commission, which includes Ashmere Lake. This report, which I realize is very old, may be of little value to you.

I have searched the records here but can find nothing further on the aforementioned dams.

Very truly yours,

William A. Heaphy

William A. Heaphy
County Engineer

WAH/dd

Enclosure

COUNTY OF BERKSHIRE, MASS.

INSPECTION OF DAMS

City or Town of North Adams Date 9, Oct. 1967
Name of Dam Windsor Lake Inspector Louis J. Diamond
Owner City-No. Adams Address City Hall, No. Adams, Mass. Tel. _____
Caretaker George Fairs Address Kemp Ave, No. Adams, Mass Tel. _____
Location East of intersection of Brasley St. and Kemp Ave.
Type and Dimensions Earth -rip-rapped- 300' lg. 30' high.

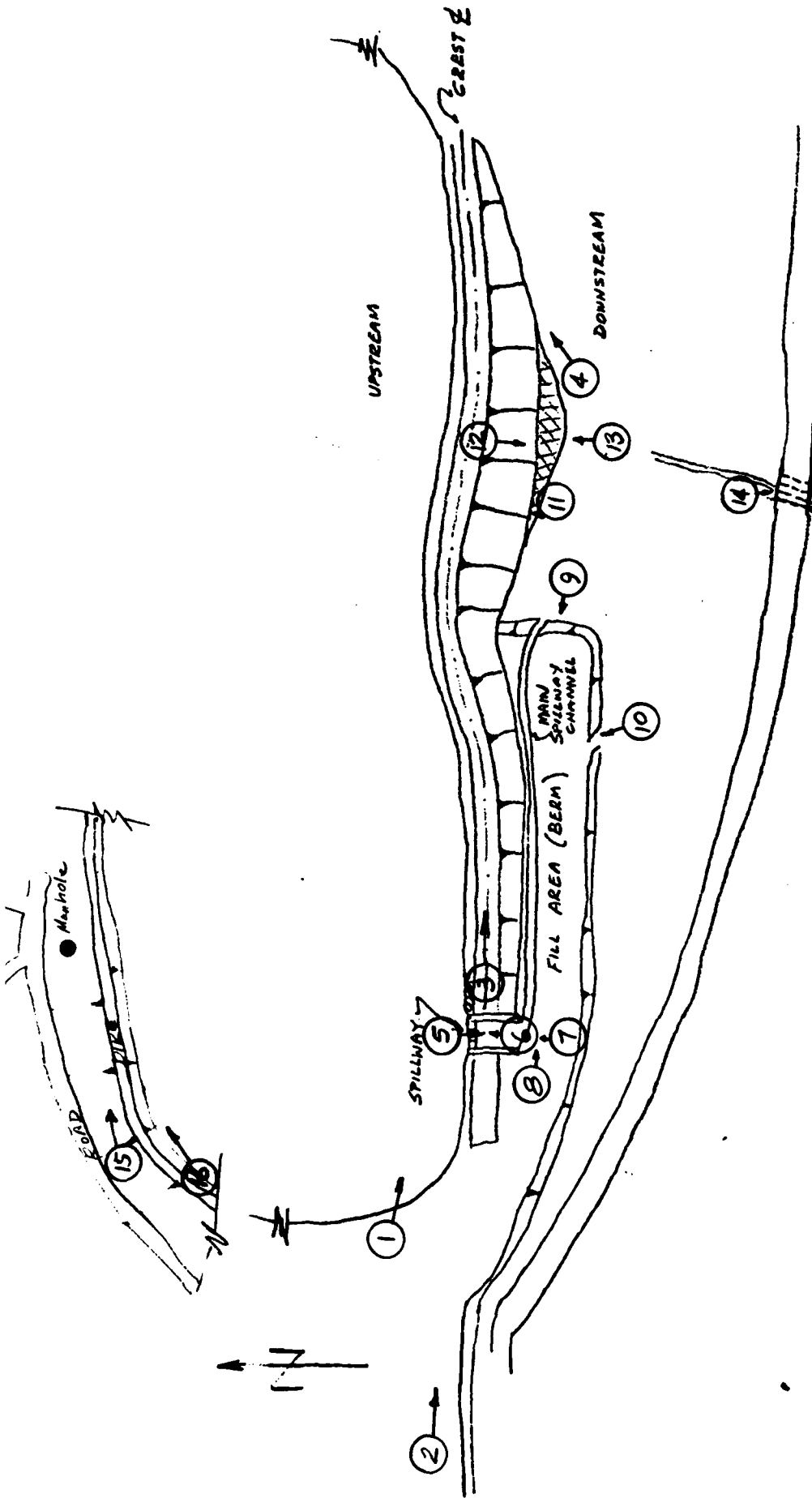
Spillway, type and size Stone masonry- 12'-6" wide- 3' freeboard.
Outlets, type and size 12" C.I. pipe and gate.
Flashboards, type and height None
Date Built 1883 Condition Good
When last repaired -- 1967 By whose orders Owners
Nature of Repairs Old pipe replaced and gate made operable

Purpose of Dam Recreation
Approximate storage of water 5,000,000 cu. ft.
Approximate area of water shed 2 sq. mi.
Possible damage due to failure of dam Heavy damage to S.E.- Church and Ashla.

Remarks Parks and Recreation Commission involved in development
of area for recreation- Most important of which is
repair of 12" gate giving control of water level to
owners. Water level down 3' at present to permit
Recommendations shoreline improvements and repair.

PHOTOGRAPHS

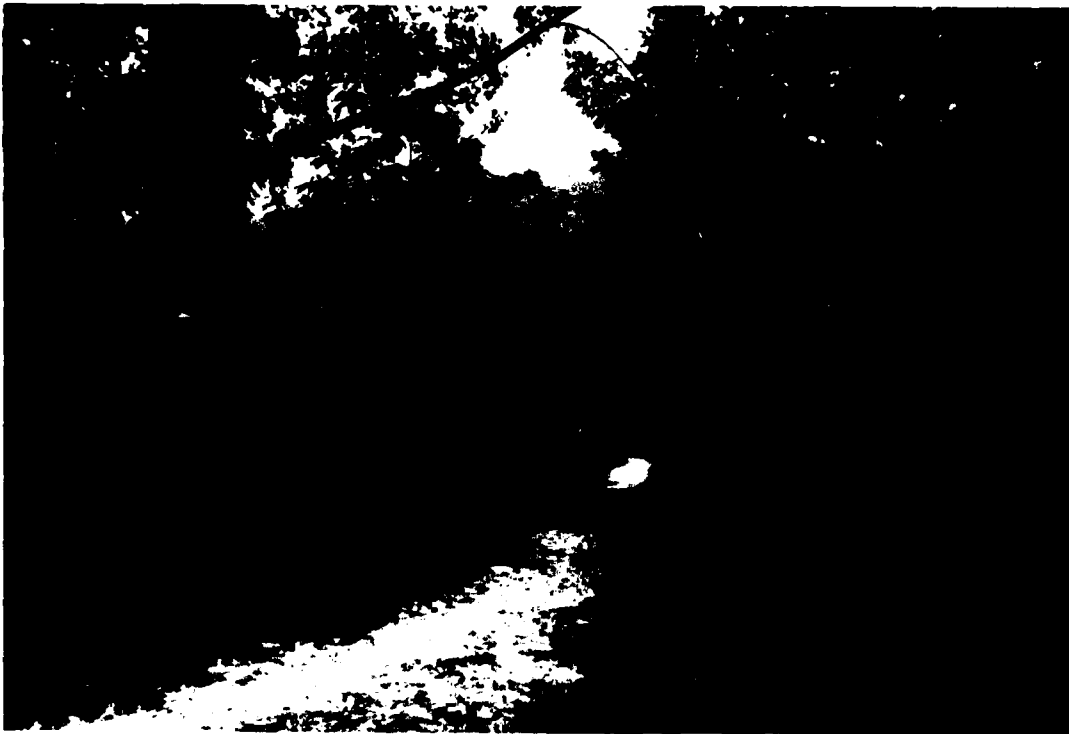
APPENDIX C



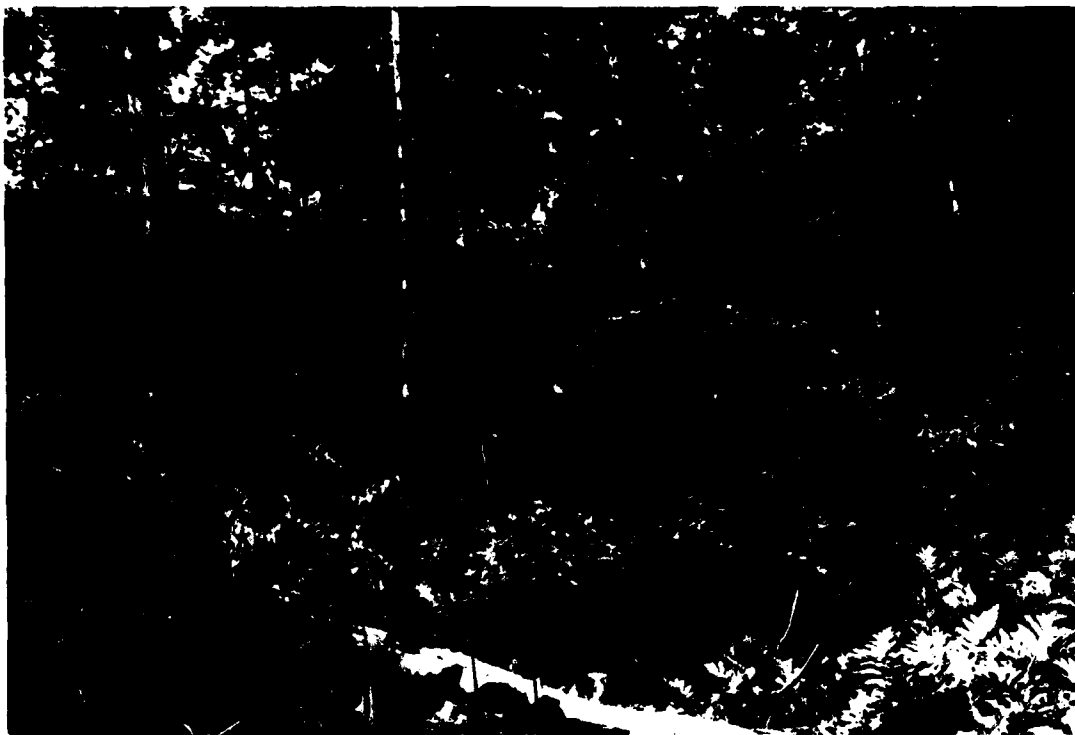
BROOKLINE	TAMS	MASS	US ARMY ENGINEER DIV. NON-FED. DAMS CONTRACT DAMS MILITARY DAMS
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
WINDSOR LAKE DAM			
PHOTOGRAPH LOCATION GUIDE			
HOOSIC RIVER			
MASS			
		SCALE	NTS
		DATE	JULY 78



② WEST ABUTMENT OF DAM



③ CREST OF DAM LOOKING EAST
NOTE PATHWAY AND HEAVY VEGETATION



④ VIEW OF DOWNSTREAM SLOPE LOOKING EAST



⑤ SPILLWAY LOOKING DOWNSTREAM
NOTE RIPRAP ON UPSTREAM SLOPE



⑥ SPILLWAY LOOKING UPSTREAM (NOTE DISPLACEMENT OF STONES),
VEGETATION IN SPILLWAY CHANNEL FLOOR AND
MISSING AND LOOSE MORTAR ON THE SPILLWAY WALL



⑦ VIEW OF SPILLWAY CHANNEL LOOKING UPSTREAM
NOTE STONES IN FOREGROUND FOR DIVERSION OF CHANNEL



⑧ DOWNSTREAM VIEW OF PRIMARY SPILLWAY CHANNEL
ALONG CONTACT OF EMBANKMENT AND BERM
NOTE STONES AT POINT OF CHANNEL DIVERSION



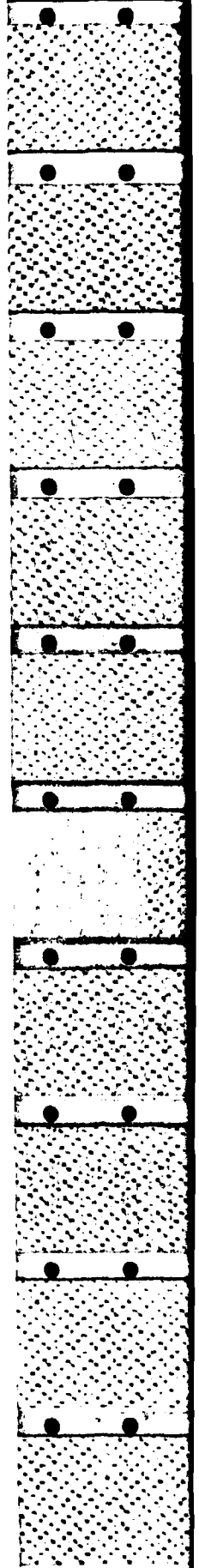
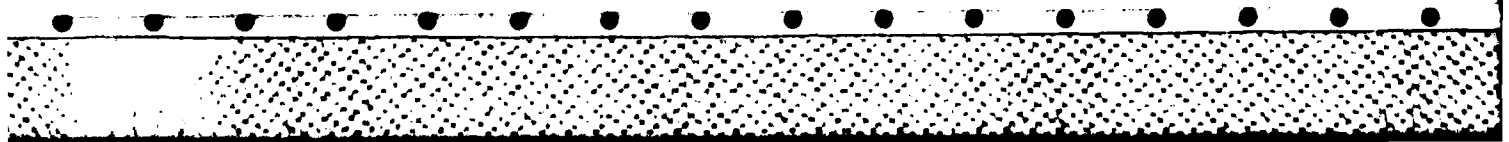
⑨ EAST EDGE OF BERM
NOTE PRIMARY SPILLWAY CHANNEL RIGHT SIDE OF PHOTOGRAPH



⑩ VIEW OF SECONDARY SPILLWAY CHANNEL
WHICH WAS FORMED AT THE SOUTHEAST EDGE OF BERM

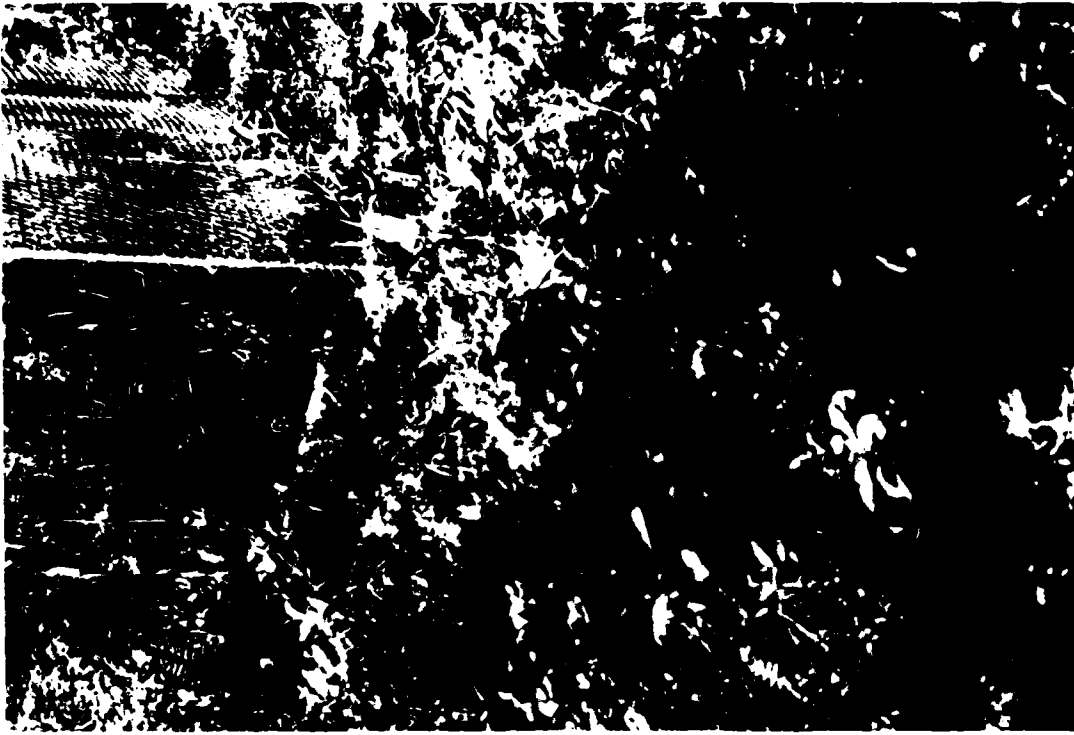


⑪ SEEPAGE AREA ALONG TOE OF EMBANKMENT

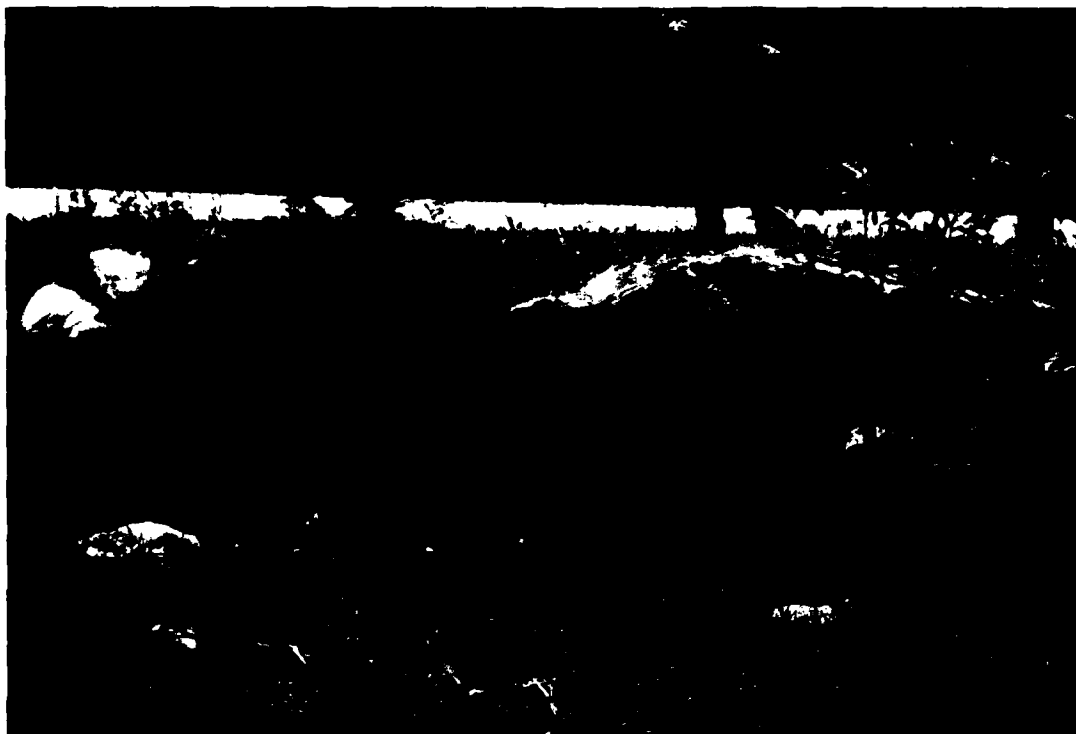




(12) VIEW LOOKING AT SWAMP AREA AT DOWNSTREAM TOE
NOTE HEAVY VEGETATION



(13) CLOSE UP OF SEEPAGE IN SWAMP AREA
LOCATED AT DOWNSTREAM TOE



④ DOWNSTREAM CHANNEL PASSING THROUGH ROADWAY PIPE CULVERTS



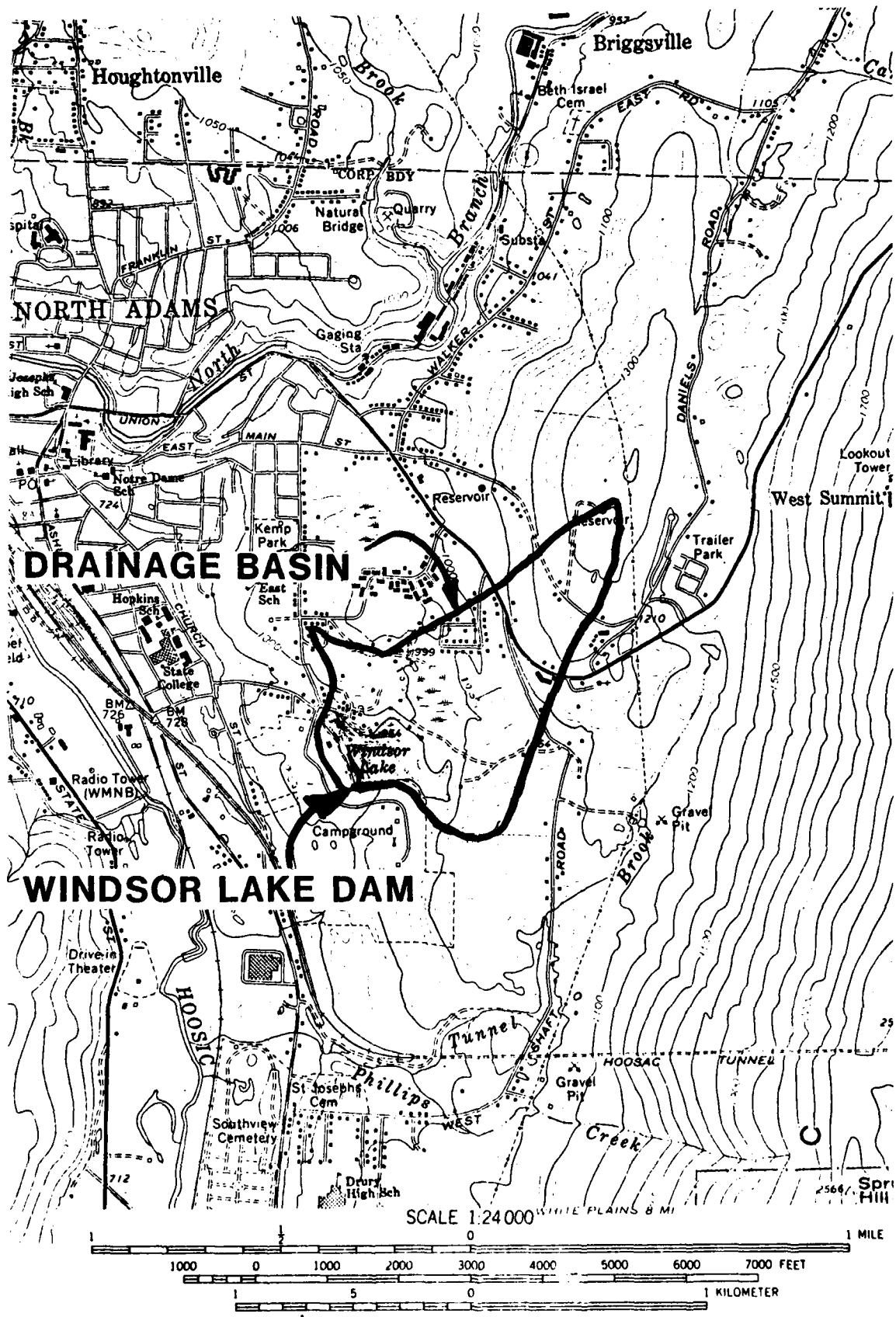
⑮ DIKE AT NORTH END OF LAKE
DOWNSTREAM SLOPE
NOTE MANHOLE FOR LOW LEVEL OUTLET GATE VALVE

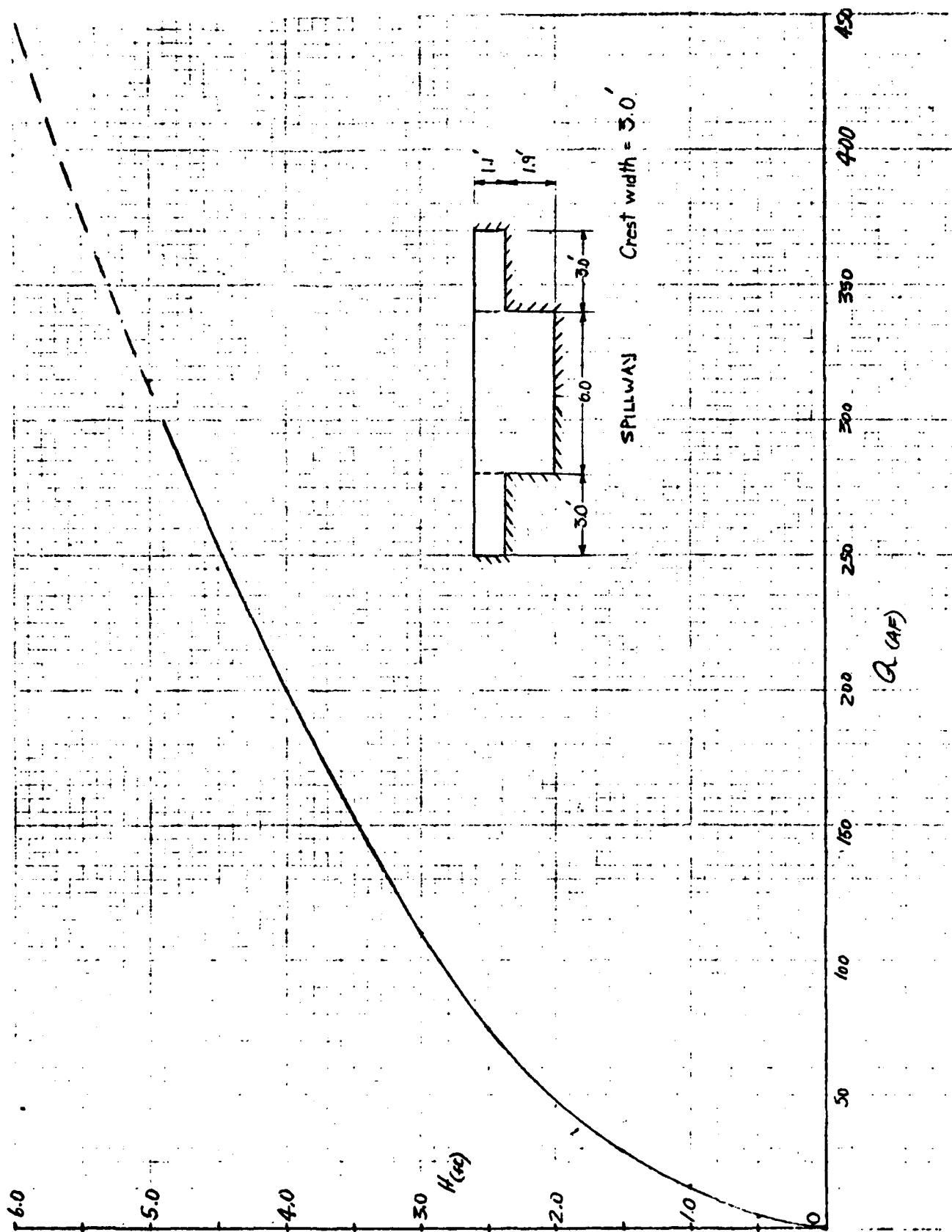


(16) DIKE AT NORTH END OF LAKE
UPSTREAM SLOPE
NOTE LARGE TREES AND VEGETATION

HYDROLOGIC DATA & COMPUTATIONS

APPENDIX D





TAMS

Job No. 1497-07

Project DAM INSPECTION

Subject WINDSOR LAKE SPILLWAY HEAD-DISCHARGE
TABLE

Sheet 2 of

Date July 13, 1978

By

Ch'k. by

Head (ft)	Outflow (CFS)
0.5	4.9
1.0	159
1.5	29.5
2.0	46.2
2.5	74.5
3.0	110.0

TAMS

Job No. _____
Project DAM INSPECTION
Subject Windsor Lake - Surcharg Storage
computation.

Sheet 3 of _____
Date July 12, 78
By D.L.C.
Ch'k. by _____

ELEV.	AREA	MEAN AREA	Δ VOL	VOL (AF)
966	25			0
967	26.3	25.65	25.65	25.65
968	27.2	26.75	26.75	52.4
969	28.6	27.9	27.9	80.3
970	29.7	29.15	29.15	109.45
971	30.8	30.25	30.25	139.7
972	31.9	31.35	31.35	171.05

TAMS

Job No. 1497-07

Sheet 4 of

Project DAM INSPECTION

Date July 12, 1978

Subject WINDSOR LAKE DAM - INFLOW HYDROGRAPH
for PMP

By M. G. G. G.

Ch'k. by

DRAINAGE AREA - 219 acres

AREA OF LAKE - 25 acres

Assume 1.0 ft. per sec rate of travel
hydraulic length of basin 4200 ft.

Lag time ~~saturation~~ = 4200 secs.
= 62 hours

Inflow hydrograph from PMP (assume 0.2"/hr infiltration loss)

Time (hrs)	Total rainfall (in/hr)	Runoff Lake (25 acres)	Drainage basin 194 acres From Excess, Rainfall	Total inflow for PMP	SPF INFLOW
1	1.5	38	(Delayed 1 hr)	38	19
2	1.8	45	252	297	149
3	3.4	85	310	395	198
4	7.0	175	621	796	398
5	2.7	68	1319	1387	694
6	1.3	33	485	518	259
7	0.8	20	213	233	117
8	0.5	13	116	129	65
9	0.5	13	58	71	36
10	0.35	9	58	67	34
			29	30	15

DAM INSPECTION
WINDSOR LAKE DAM - NORTH ALAMS
MASSACHUSETTS
SPT STANDARD PROJECT FLOOD

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL	CATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
966.00	0.25	0.00	11.00	1	NO	NO	1.000	1.000	1.000	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CFS)
966.00	0.0000	0.00
967.00	25.6500	15.90
968.00	52.4000	46.20
969.00	80.3000	110.00
970.00	109.4500	200.00
971.00	139.7000	315.00
972.00	171.0500	450.00

(HRS)	(CFS)	(CFS)	(ACFT)	(FT.)
0.00	0.00	0.03	6.0000	966.00
0.25	4.75	0.12	0.2487	966.00
0.50	9.50	0.12	0.1944	966.00
0.75	14.25	0.27	0.4357	966.01
1.00	19.00	0.47	0.7714	966.03
1.25	23.75	0.92	1.4953	966.05
1.50	28.50	1.77	2.8372	966.11
1.75	33.25	3.02	4.8759	966.12
2.00	38.00	4.67	7.5421	966.29
2.25	42.75	6.54	10.6308	966.41
2.50	47.50	8.63	13.9516	966.54
2.75	52.25	10.81	17.4419	966.68
3.00	57.00	13.11	21.1170	966.82
3.25	61.75	15.78	25.4679	966.99
3.50	66.50	21.64	30.7220	967.18
3.75	71.25	28.61	36.8760	967.41
4.00	76.00	36.58	43.9088	967.68
4.25	80.75	45.79	52.0450	967.98
4.50	85.50	66.77	61.3996	968.32
4.75	90.25	90.60	71.5173	968.62
5.00	95.00	119.07	83.2394	969.10
5.25	99.75	151.24	93.6587	969.45
5.50	104.50	174.70	101.2574	969.71
5.75	109.25	189.99	106.2097	969.88
6.00	114.00	197.62	108.6792	969.97
6.25	118.75	200.38	109.5523	970.00
6.50	123.50	200.79	109.6588	970.00
6.75	128.25	198.76	109.0499	969.93
7.00	133.00	194.80	107.7686	969.94
7.25	137.75	189.59	106.0811	969.88
7.50	142.50	183.90	104.2376	969.82
7.75	147.25	177.76	102.2479	969.75
8.00	152.00	171.19	100.1209	969.68
8.25	156.75	164.40	97.9227	969.60
8.50	161.50	157.59	95.7153	969.52
8.75	166.25	150.75	93.4991	969.45
9.00	171.00	143.88	91.2748	969.37
9.25	175.75	137.20	89.1104	969.30
9.50	180.50	130.90	87.0097	969.23
9.75	185.25	124.95	85.1451	969.16
10.00	190.00	119.35	83.3295	969.10
10.25	194.75	113.93	81.5735	969.04
10.50	199.50	108.92	79.8297	968.98
10.75	204.25	104.91	78.0780	968.92
11.00	209.00	100.87	76.3113	968.85
MAX. VALUES				970.00
MIN. VALUES				966.00

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

IDENTITY NUMBER	STATE	COUNTY	CITY	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
MA 281	MA	003	01	WINDSOR LAKE DAM	4241.5	7305.6	08SEP78

POPULAR NAME	NAME OF IMPROVEMENT
	WINDSOR LAKE

NEAREST DOWNSIDE CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
NORTH ADAMS	1	19200

TYPE OF DAM	YEAR COMPLETED	PURPOSES	DESIGN	HYDRAULIC	IMPROVING CAPACITIES
HEPG	1983	R	21	20	105

REMARKS

D/S	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU YD)	POWER CAPACITY (KW)	NAVIGATION LOCKS
1	375 U	6	110	10000	

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF NORTH ADAMS		

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
TIPPETTS-ABBETT-MCCARTHY-STRATTON	21JUN78	PL 92-367

REMARKS

DIST OWN FED R PRV/PED SCS A VER/DATE
 MED N N N N 17AUG78

END

FILMED

7-85

DTIC